



ORIGINAL ARTICLE

Clinical experience and microbiologic characteristics of invasive *Staphylococcus lugdunensis* infection in a tertiary center in northern Taiwan



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KEYWORDS

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Background/Purpose: *Staphylococcus lugdunensis* is a coagulase-negative staphylococcus that cannot be ignored. This study is a comprehensive analysis of the clinical and microbiological characteristics of *S. lugdunensis* bacteremia and sterile site infection during hospitalization. **Methods:** This retrospective study included 48 patients with invasive *S. lugdunensis* infection. During the period of March 2002 to July 2012, they had been hospitalized in a tertiary center of northern Taiwan. Demographics, clinical characteristics, and risk factors of mortality were analyzed. All isolates were tested for antimicrobial susceptibility. We identified the staphylococcal cassette chromosome mec (SCCmec) gene for oxacillin nonsusceptible isolates. **Results:** The incidence of *S. lugdunensis* in coagulase-negative staphylococci bacteremia was 0.87%. Forty-eight patients were enrolled: *S. lugdunensis* was present in 41 patients with bacteremia, in the ascites of three patients, in the synovial fluid of two patients, in the pleural effusion of one patient, and in the amniotic fluid of one patient. The three most common sources of infection were primary bacteremia (43.8%), catheter-related infection (18.8%), and vascular graft infection (12.5%). All-cause mortality during hospitalization was 20.8% (10/48). All deceased patients were bacteremic. Risk factors associated with in-hospital mortality included a Pittsburgh bacteremia score of 2 or greater, infective endocarditis, and end-

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stage renal disease. Ten (20.8%) isolates were resistant to oxacillin, and 8 isolates were classified as SCCmec type V.

Conclusion: The clinical significance of *S. lugdunensis* should not be ignored, especially in patients with severe comorbidities. An aggressive search for endocarditis is strongly suggested in *S. lugdunensis* bacteremic cases.

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Introduction

Staphylococcus lugdunensis, which was named after the city where the organism was initially isolated, is a species of coagulase-negative staphylococci (CoNS). Since its first description in 1988 by Freney et al.,¹ this organism has been considered a human pathogen that cannot be ignored.² In contrast to other CoNS, the behavior of *S. lugdunensis* is more like that of *Staphylococcus aureus*.² *S. lugdunensis* causes a wide spectrum of infections such as skin and soft tissue infection, bone and joint infection, meningitis, catheter-related infection, bacteremia, and infective endocarditis.² The most common sites are skin and soft tissue.^{3,4} However, most articles have focused on *S. lugdunensis*-related bacteremia and infective endocarditis.^{5–7} Some studies on CoNS-related bacteremia have demonstrated that the most common pathogen is *Staphylococcus epidermidis* (incidence rate ranges from 35% to 67.6%), followed by *Staphylococcus haemolyticus* and *Staphylococcus hominis*.^{8,9} The mortality rate of patients with CoNS bacteremia ranges from 8% to 14.3%.^{8,9} There is no statistical significance in mortality between species. *S. lugdunensis* was not particularly identified in these studies, probably because it constitutes a very small proportion of CoNS.¹⁰ The mortality rate of patients with *S. lugdunensis* bacteremia varies in relation to the presence of infective endocarditis.¹¹ The mortality rate associated with *S. lugdunensis* endocarditis is reportedly higher than that of *S. aureus* and *S. epidermidis*.²

There are limited articles that discuss *S. lugdunensis* in Asia.^{4,11–14} In these articles, there are some discrepancies between the infectious origin (i.e., the setting of the acquired infection), involved infectious foci, and antimicrobial susceptibility. In Taiwan, only one study issued the characteristics of community-acquired *S. lugdunensis* infection, whereas a few cases described in other series have focused on infective endocarditis.^{5,13,15} Furthermore, only a few studies mention the prevalence and genotypes of oxacillin-resistant *S. lugdunensis*.^{4,16,17}

We designed this retrospective study to investigate the clinical characteristics and risk factors of mortality of *S. lugdunensis* bacteremia and sterile site infection. All isolates underwent antimicrobial susceptibility testing. In methicillin-resistant *S. aureus* (MRSA), most health care-associated or nosocomial clones are associated with staphylococcal cassette chromosome mec (SCCmec) type II or type III, and most community-associated MRSA (CA-MRSA) strains are associated with SCCmec type IV.¹⁸ *S. lugdunensis* is short of relevant information. Therefore, we performed SCCmec gene classification for the oxacillin-resistant isolates in our study.

Materials and methods

Setting

This retrospective study was conducted at Chang Gung Memorial Hospital at Linkou (CGMH-Linkou; Taoyuan, Taiwan), a 3715-bed tertiary center in northern Taiwan. It was approved by the research ethics committee (i.e., institutional research board) of CGMH-Linkou (101-4429B).

Study design and patients

Between March 2002 and July 2012, 88 *S. lugdunensis* isolates from sterile sites (e.g., blood, ascites, pleural effusion, synovial fluid, amniotic fluid) were identified through our computer-assisted microbiology laboratory database. Isolates collected from postsurgical drainage tubes were excluded because of the high probability of contamination.

S. lugdunensis isolated from two or more consecutive blood cultures or sterile body fluids of patients were considered clinically significant cases. For patients with a single positive blood culture of *S. lugdunensis*, the clinical significance was determined in accordance with the criteria developed in 1998 by Souvenir et al.¹⁹ Patients were considered to have a clinically significant case if they had one or more of the following: prolonged fever with a temperature of 38°C or greater; hypotension with a systolic blood pressure less than 90 mmHg; leukocytosis or leukopenia with a left-shifted differential; or disseminated intravascular coagulopathy in combination with a major risk factor for potential infection caused by skin flora (including long-term intravascular catheterization used for hospitalized patients, immunosuppressed patients with central lines, patients with peritoneal dialysis or hemodialysis, and other patient populations). Chart review was used to collect data such as demographics, comorbidities, origin of infection, source of infection, illness severity, indications for admission to intensive care units, and outcomes.

Definitions

The Pittsburgh bacteremia score and severe sepsis (defined by surviving sepsis campaign²⁰) were used to assess acute illness severity. Acute kidney injury was reflected by an increase in the serum creatinine (SCr) level by at least 0.3 mg/dL (26.5 mmol/L) within 48 hours; as an increase in the SCr level to at least 1.5 times the baseline level, which is known or presumed to have occurred within the previous 7 days; or as a urine volume less than 0.5 mL/kg/h for 6 hours.²¹ The origin of infection was defined as: (1)

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